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ABSTRACT

An exploration of the clinical usefulness of the Brazelton Neonatal Behavioral Scale was made. A specific pediatric problem was studied, i.e., a baby born to a heroin-addicted mother taking methadone. The control sample was a population of 41 babies who were part of a larger study. Both methadone and control infants were tested between 48 and 72 hours of age by one of three examiners. Results are given. It is concluded that the Scale is reliable as an index of neonatal behavior variations in a group of sick infants and as a means of following the course of a sick infant over hours and days. Further research is recommended. (CK)

Clinical Implications of the Brazelton Scale*

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The Brazelton Neonatal Behavioral Scale is presently employed as a research instrument in a variety of developmental and cross-cultural studies. As a sensitive index of behavioral variations in the newborn infant, the Scale successfully differentiates behavior patterns among racial groups as well as delineates individual temperamental traits. Most studies to date have used normal subjects, rigorously screening out such pre- and postnatal conditions as maternal illness, complications of labor and delivery, and illnesses afflicting the fetus and newborn. While there has been an implicit assumption that the Scale is sensitive to such factors, nonetheless their effect upon infant behavior has not been demonstrated. The value of the Brazelton Scale as a clinical instrument remains unexplored. As increasingly reliable standards of normal Brazelton Scale performance become available, it now seems appropriate to investigate the behavioral manifestations of specific maternal and neonatal abnormalities previously ignored.

In our attempts to explore the clinical usefulness of the Scale, we elected to study a specific pediatric problem, choosing as our model the baby born to the heroin-addicted mother taking methadone. We elected

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to study these infants because it seemed highly likely that they would manifest some behavioral effects from their drug withdrawal, as well as from their variety of other problems. It appeared probable that we would find aberrant Brazelton scores for the methadone baby--aberrant with respect to a "control" population--and that we could gain some understanding of how potentially useful the exam may be clinically.

Babies born to mothers taking methadone are subject to a number of adversities. The 19 subjects we tested are seen in several Washington metropolitan area hospitals and were part of a larger longitudinal study. Maternal histories are varied and saddening. Some of the mothers had been heroin addicts supporting themselves through prostitution until the advancing pregnancy cut off her means of livelihood. Some mothers entered the methadone program out of financial necessity as a means of reducing their narcotic habits; others entered primarily out of concern for the welfare of their children. All too often there was minimal or no prenatal care. Only one-third of the mothers received adequate care; 40% of the mothers were seen for the pregnancy for the first time when admitted in labor. Such complications of pregnancy as edema, malnutrition and anemia were common, as were the illnesses which so frequently afflict the addict. The drug history was obscure: the women probably felt they had little to gain in giving a candid account of their use of illegal drugs. The mothers were prescribed a methadone dosage of from 20 to 110 mg a day. Since the inducement to sell such a drug on the black market would be high in this poverty-stricken group, it is not known to what extent they were taking the prescribed dosage. Some women gave a history

of having injected heroin--often for the first time in months--just prior to admission to the hospital. In addition, since most street drugs are of dubious authenticity and potency, the drug status of these women is highly confusing to both patient and medical personnel alike. The women were of several races, with black predominating; the race of the father was not available information to us, but some of the babies appeared to represent mixed racial backgrounds.

The methadone baby, then is a focus of both medical and social disaster, representing a formidable diagnostic and therapeutic challenge. Many do "withdraw" from their intrauterine exposure to methadone; most are cause for lasting concern in their return to physically deprived environments.

Our control sample is a population of 41 babies who are part of a larger developmental study. They are a homogeneous group in that all were born at a large military hospital and are the normal products of uncomplicated first pregnancies followed routinely in the hospital's ante-partum clinic. The parents of the control infants are white and represent military personnel of all ranks.

Both methadone and control infants were tested between 48 and 72 hours of age by one of three examiners who had previously established inter-tester reliability in excess of 90%. In addition, a number of the methadone babies were studied with serial exams from the time of birth.

Group differences on those Brazelton scores obtained at 48 to 72 hours are summarized in the table handed out. None of the methadone or

control subjects reported in the table had received any drug treatment prior to the time of this exam.

From the table, it will be seen that methadone babies have both higher initial and predominant states--that is, they are more often in an alert, irritable or crying condition. They do not differ in attractiveness or in the presence of interfering exam variables.

Methadone and control babies do not differ in their ability to use various activities to quiet themselves.

Of the four habituation items, methadone babies differ on only one--decrement to light. They habituate less rapidly to light than do the controls.

On orientation items, a distinctive pattern of differences emerges. On items involving a visual component--inanimate visual (ball), animate visual (face) and animate visual and auditory (face and voice)--the methadone subjects are less oriented than are the controls. Not surprisingly, they are also significantly less "alert" than the controls as well.

Methadone subjects are more hypertonic and manifest less motor maturity than controls, but show no significant differences on pull-to-sit, cuddliness, defensive movements or consolability. Methadone subjects prove to have higher peaks of excitement, to build up more rapidly and to be more irritable and tremulous, but show no difference from controls in activity level or number of startles. They have more state lability than the control subjects. Finally, on the self-quieting, hand-to-mouth and smile items, there are no differences.

Before discussing the differences in the groups' Brazelton scores, I would like to consider some of the differing characteristics of the two samples which might be related to the Brazelton findings. The methadone and control groups do differ in a number of respects--such as race, parity, socioeconomic status, type of prenatal care and so on. These differences deserve careful consideration. It is not our intent to claim that methadone or some other factor alone is in itself responsible for score variations. Such statements must await more sophisticated methodologies: other samples must be gathered, for example, from other socioeconomic and racial groups. This methadone sample is too small to allow conclusive statistical analyses. We did run appropriate comparisons within the methadone group on a number of these independent variables. For example, we compared the Brazelton scores of those methadone babies whose mothers had received anesthesia with scores from those whose mothers had not. In all of these analyses we find only sparse and apparently random statistically significant differences. We feel that there are indications, however, that characteristics other than drug use are important in understanding score variations. It is probable that a number of these variables are acting in interdependent fashion in the methadone baby to produce the variations in Brazelton scores. We would like to speak to these factors as best we can at this point.

Race is a perplexing issue in this study, especially in view of the documentation by other workers of inter-racial differences among infants. It would have been extremely difficult to "control" for race rigorously in this situation.

The birth weights of the methadone group are lower than the controls--the means being 2,680 grams and 3,457 grams respectively. Some of this difference may derive from racial factors as black babies weigh on the average less than white babies do. But the racial admixture of the groups involved here and the wide gap in average birth weights indicate that other factors are involved. Gestational age is not an important influence in this regard; nearly all of the methadone babies were term by dates and the methadone and control groups do not differ significantly in this respect. Five of the nineteen methadone babies fall within that difficult diagnostic category in pediatrics: the "small-for-dates" baby. Just what combination of maternal drug use, malnutrition or medical neglect is operating here remains obscure. However, when the methadone group is divided into two subgroups around the mean weight, no differences are found in the Brazelton scores of high vs. low birth weight babies. Likewise, the "small-for-dates" babies do not differ significantly as a subgroup from other methadone babies who are not "small-for-dates." This suggests that birth weight or being "small-for-dates" are very probably not major factors in the score variations found in the methadone babies.

There is a marked tendency to administer little or no medication to the methadone mother during labor. They received significantly fewer opioids and tranquilizers. This finding is paralleled by a trend to give either no anesthesia at delivery or a general one. Some of the mothers in the control group received no anesthesia, but these are almost universally women who completed natural childbirth courses and planned an unmedicated delivery.

Turning now to the differences in Brazelton scores between the two groups, we would like to comment on several points. The methadone baby's most obvious problem is certainly his or her state of narcotic withdrawal, and this figures prominently in the patterns of variation found in the Brazelton scores. Typically, these are hyper-alert infants who tend to be in a neurologically irritable condition. A striking pattern in differing function of visual and auditory modalities is also present however, and less easy to understand. While quite available and responsive to auditory stimuli, the methadone subjects respond poorly to visual stimuli. This does not seem to be a function of pupil size--which is within normal limits. Amount of lighting does not seem to be the crucial factor either: the same differentiating pattern between light and sound is present in the habituation items as well and here the infants have their eyes closed. Longitudinal follow-up now underway may increase our understanding of this phenomenon as the visual and auditory development of the children is studied.

Although an understanding of the differences between methadone and control groups must wait on time, we do feel that the Brazelton Scale has already proved itself a reliable index of neonatal behavior variations in a group of sick infants. We feel that the Scale can be easily applied within intensive care nurseries and that it is a helpful adjunct in the management of the infants. For example, the Scale demonstrates that while hyper-irritable, the methadone baby is also quite consolable and not at all unavailable to nursing staff attempts to soothe. We made use of this information and found that it is possible in most cases to avoid using

valium or thorazine to treat the withdrawal (and also prolong it). Swaddling the infants, talking to them and supplying them with pacifiers maintains them in a calm state. In this instance, the management of the infants was directly affected by our use of the Scale.

We are hopeful that the distinctive pattern of score variation in these infants may be used as a diagnostic aid to identify potential problems in cases where the maternal drug history is suspicious but obscure and the infant initially appears to be normal. In our opinion, the behaviors measured by the Brazelton Assessment are the earliest and most sensitive indicators of pathology in these instances. By administering the Scale in a doubtful case, one might hope to arrive at an earlier diagnosis of withdrawal. For example, a baby with a suspicious history but normal neurologic exam might show on the Brazelton Scale a differing function of visual and auditory modalities and appear irritable but consolable. In such a case, the Scale's findings might prompt the clinician to observe the child more closely, or perhaps reinterview the mother. We also feel that the Scale will be helpful in assessing other types of problem infants. The objective scoring provides exact as well as rich behavioral description in a situation where the clinician must usually be content with the frustrating feeling that "there is something peculiar about this baby." The Scale objectifies and quantifies much of this peculiarity.

The Scale is also helpful as a means of following the course of a sick infant over hours and days. It was possible for us to plot the course of a drug withdrawal over days in several infants that we studied

longitudinally. We were also able to plot over time the manner in which an item score changed following administration of a drug, such as valium. The usual clinical evaluation of such important parameters as irritability and tremulousness is highly subjective; the Scale provides a sensitive and reliable measure of these items.

We are as yet in no position to make claims for the efficacy on the Scale as a prognosticator in these infants. As the children continue to be followed, it should be possible to gain some understanding of the Scale's value in this respect.

As more data are gathered on groups of infants suffering from various pathologies--such as malnutrition, prematurity or birth trauma--we will begin to understand more clearly the etiology of behavioral abnormalities in the methadone baby. The potential utility of the Brazelton Scale in clinical research is great; its helpfulness as a diagnostic and therapeutic adjunct is unquestionable.

METHADONE AND NORMAL
GROUP DIFFERENCES ON BRAZELTON SCALE ITEMS

Item	Level of Significance*	Direction of Difference
Initial State	<.05	meth higher (more aroused)
Predominant State A	<.01	meth higher
Predominant State B	ns	
Quieting: Hand to Mouth	ns	
Quieting: Sucking	ns	
Quieting: Stimuli	ns	
Quieting: Posture	ns	
1 Response Decrement: Light	<.05	meth lower (less decrement)
2 Response Decrement: Rattle	ns	
3 Response Decrement: Bell	ns	
4 Response Decrement: Pin	ns	
5 Response to Ball (Inan. Vis.)	<.001	meth lower (less responsive)
6 Response to Rattle (Inan. Aud.)	ns	
7 Response to Face (An. Vis.)	<.001	meth lower
8 Response to Voice (An. Aud.)	ns	
9 Response to Face and Voice	<.001	meth lower
10 Alertness	<.001	meth lower (less alert)
11 Tonus	<.001	meth higher (more hypertonic)
12 Motor Maturity	<.001	meth lower (less mature)
13 Pull to Sit	ns	
14 Cuddliness	ns	
15 Defensive Movements	ns	
16 Consolability	ns	
17 Peak of Excitement	<.02	meth higher (more excited)
18 Rapidity of Buildup	<.001	meth higher (more rapidly)
19 Irritability	<.01	meth higher (more irritable)
20 Activity	ns	
21 Tremulousness	<.001	meth higher (more tremulous)
22 Startles	ns	
23 Color Lability	not scored	
24 State Lability	<.001	meth higher (more labile)
25 Self-Quieting	ns	
26 Hand to Mouth Activity	ns	

*Note.--Tests of significance were the chi-square for items treated as di- or trichotomous variables and the t-test for continuous variables. Decisions as to the continuity of the variables were made on the basis of the conceptual organization of the scale items and prior to data analysis.